IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Application of:	**Kazlas et al.**
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Cambridge, Massachusetts
August 18, 2010

APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Sir:

This is an appeal from the rejection of all claims of the above application as set forth in the Office Action mailed December 24, 2009.

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REAL PARTY IN INTEREST

The real party in interest in this appeal is E Ink Corporation, the assignee of record, a corporation organized and existing under the laws of the State of Delaware, of 733 Concord Avenue, Cambridge, MA 02138-1002. E Ink Corporation is now a wholly owned subsidiary of Prime View International Co, Ltd. of Hsinchu, Taiwan.

RELATED APPEALS AND INTERFERENCES

There are no related appeals and interferences.

STATUS OF CLAIMS

Claims 1-12, 14, 15 and 24-26 are pending in this application, claims 13, 16-23 and 27-31 having previously been cancelled. All pending claims stand finally rejected. No claim is subject to a restriction or election requirement. All pending claims are appealed. A copy of the claims on appeal appears in the Appendix to this Brief.

STATUS OF AMENDMENTS

All Amendments filed during prosecution of this application have been entered; no Amendment was filed after the final Office Action.

SUMMARY OF CLAIMED SUBJECT MATTER

Claim 1 is directed to a backplane (100 in Figure 1 – see Paragraph 70; 200 in Figure 2 – see Paragraph 71; 300 in Figure 3 – see Paragraph 72; 400 in Figure 4 – see Paragraph 73) for use in an electro-optic display. The backplane comprises a patterned metal foil (102, and see Paragraph 70, second sentence) having a plurality of apertures extending therethrough. The patterned metal foil (100; 200; 300; 400) is coated on at least one side with an insulating polymeric material (104 in Figure 1, and see Paragraph 70, second sentence; 204 and 208 in Figure 2, and see the whole of Paragraph 71). A plurality of thin film electronic devices (electronic layer 106 in Figures 1 and 2, and see Paragraph 70, second sentence; 302 in Figure 3; 402 in Figure 4) provided on the insulating polymeric material (104; 204, 208). The insulating polymeric material (104; 204, 208) separates the thin film electronic devices (106; 302; 402) from the patterned metal foil (100; 200; 300; 400).

As explained at Paragraphs 13-19 of the specification, one major advantage of many of electro-optic media is their ability to be printed or coated on to a wide variety of flexible and rigid substrates; for example, US 2002/0019081 describes flexible encapsulated electrophoretic displays formed by coating a stainless steel (or similar metal) foil with a polymeric layer, forming thin film transistor on the polymer and then coating the transistors with the encapsulated electrophoretic medium to form an active matrix display. Other published papers describe similar foil-based displays. Preferred flexible displays of this type use a thin (75-250 μm) continuous stainless steel foil as the substrate, steel being because of its overall performance from initial transistor processing through final operating display. High-quality, low-cost steel foils are available in high-volume, and the high-temperature and excellent dimensional stability properties of steel allow formation of thin film transistors (TFT's) without any pre-processing using conventional TFT manufacturing technologies.

However, stainless steel and similar metal foils are substantially denser than other potential substrate materials such as plastics. As a result, flexible displays using such metal substrates of the type described in the aforementioned publications will weigh more than displays formed on plastic substrates of the same thickness. The present invention provides a backplane for use in an electro-optic display, this backplane using a metal substrate but being lighter in weight than the metal-based substrates described above. The backplane of the present invention substantially maintains the dimensional stability of a continuous metal foil (see Paragraph 69, last sentence); such dimensional stability is of course important in ensuring absence of malfunctions in electronic components formed on the foil substrate

Claim 2 is directed to a backplane according to claim 1 wherein the apertures are arranged on a rectangular grid; see for example Figures 3 and 4 and the related description at Paragraphs 72-73.

Claim 3 is directed to a backplane according to claim 1 wherein the apertures occupy at least about 30 percent of the area of the patterned metal foil. Claim 4 is similarly directed to in which a backplane according to claim 1 wherein the apertures occupy at least about 30 percent of the area of the patterned metal foil. For both claims see Paragraph 23.

Claim 5 is directed to a backplane according to claim 1 wherein the patterned metal foil is coated on both sides with an insulating polymeric material. See Figure 1, polymeric material 104 and Figure 2, polymeric materials 204 and 208.

Claim 6 is directed to a backplane according to claim 5 wherein the patterned metal foil is coated on both sides with the same insulating polymeric material. See Figure 1, in which the metal foil 102 is coated on both sides with the same polymeric material 104.

Claim 7 is directed to a backplane according to claim 5 wherein the patterned metal foil is coated on its two sides with different insulating polymeric

materials. See Figure 2, in which the metal foil 102 is coated on one side with polymeric material 204 and on the other side with polymeric material 208.

Claim 8 is directed to a backplane according to claim 1 wherein each of the thin film electronic devices lies entirely within the area of one aperture in the metal foil. See Figure 3 and the related description at Paragraph 72, in which each of the devices 302 lies entirely within the area of one aperture in the metal foil.

Claim 9 is directed to a backplane according to claim 1 wherein each of the thin film electronic devices extends across a plurality of apertures in the metal foil. See Figure 4 and the related description at Paragraph 73, in which the device 402 extends across multiple apertures in the metal foil.

Claim 10 is directed to an electro-optic display comprising a backplane according to claim 1; see, for example, Paragraph 25.

Claim 11 is directed to an electro-optic display according to claim 10 comprising an encapsulated electro-optic medium; see, for example, Paragraph 25.

Claim 12 (see especially Figure 5D and the related description at Paragraphs 79-80 and 83) is directed to a backplane for use in an electro-optic display. The backplane comprises a metal foil (502A) coated on at least one side with an insulating polymeric material (504). A plurality of thin film electronic devices (506) are provided on the insulating polymeric material (504). The backplane further comprises at least one conductive via (510) extending through the polymeric material (504) and electrically connecting at least one of the thin film electronic devices (506) to the metal foil (502A). The metal foil (502A) serves as at least one of an antenna, an inductor loop, a power plane, a capacitor, a capacitor contact, a pixel electrode, and electromagnetic induction shielding (see Paragraph 83).

Claim 14 is directed to an electro-optic display comprising a backplane according to claim 13. See Paragraph 28.

Claim 15 (see especially Figure 5D and Paragraphs 26 and 28) is directed to an electro-optic display comprising a backplane. This backplane comprises a metal foil (502A) coated on at least one side with an insulating polymeric material (504) and having a plurality of thin film electronic devices (506) provided on the insulating polymeric material (504). The backplane further comprises at least one conductive via (510) extending through the polymeric material (504) and electrically connecting at least one of the thin film electronic devices (506) to the metal foil (502A). The electro-optic display has the form a smart card (see Paragraph 28), the metal foil (502A) serving to communication between the card and a card reading apparatus.

Claim 24 (see Figures 9 and 10 and the related description at Paragraphs 122-125) is directed to an electro-optic display (900) having a metal substrate (908). The display (900) has a central portion (902) comprising an electro-optic material (914) and means (TFT backplane 912) for writing an image on the electro-optic material (914). The display (900) also has a peripheral portion (904) extending around at least part of the periphery of the central portion (902), the peripheral portion (904) having a plurality of apertures (906) extending through the metal substrate (908), by means of which apertures (906) the electro-optic display (900) may be stitched to a flexible medium, such as a fabric (see the last sentence of Paragraph 123).

Claim 25 is directed to an electro-optic display according to claim 24 wherein the peripheral portion (904) of the display is free from the electro-optic material (914); see Figure 10, which shows that the electro-optic material (914) does not extend over the peripheral portion (904).

Finally, claim 26 is directed to an electro-optic display according to claim 24 wherein the peripheral portion extends completely around the central portion so that the entire periphery of the electro-optic display can be stitched to the flexible medium; see Figure 9, in which the peripheral portion (904) complete encircles the central portion (902), and see the last sentence of Paragraph 123.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The only remaining ground of rejection is believed to be that set out in the aforementioned final Office Action. (This application has undergone a lengthy and complicated prosecution. After an initial Office Action requiring an election of invention, there followed three non-final Office Actions, a final Office Action, a Request for Continued Examination, three more non-final Office Actions, and the aforementioned final Office Action. As noted above, the application has been pending since November 2003.) This remaining ground of rejection is that claims 1-12, 14, 15 and 24-26 are unpatentable under 35 USC 103(a) over Blackwell et al., U. S. Patent No. 5,288,541 in view of Iwanaga et al., U. S. Patent No. 6,033.742.

ARGUMENT

Summary

Proper interpretation of the claims of the present application requires that the metal foil to continuous and mechanically coherent. Neither Blackwell nor Iwanaga describes a structure having, *at the same time*, a patterned metal foil having a plurality of apertures therein, a coating of an insulating polymeric material on at least one side of the metal foil, and thin film electronic devices on the polymeric material, as required by the present claims. Nor does the combination of the two references furnish any incentive to the skilled worker to produce such a structure.

Detailed argument

(a) Interpretation of the term "metal foil"

Claims 1-12, 14 and 15 all require a metal foil. In view of the disclosure in Blackwell (see Section (b) below), some consideration of the term "metal foil" appears to be required. A typical dictionary definition of "foil" is "a very thin sheet or leaf of metal" (taken from Webster's New Twentieth Century Dictionary", Collins World, 1976). Whatever the exact words used to define "foil" it is surely inherent in the term that the foil be continuous in the topological sense. Indeed, it is difficult to see what meaning could reasonably be given to "patterned metal foil" if the foil were not continuous, so that the material surrounding the apertures is connected and coheres together as a continuous layer. Furthermore, it is noted that Paragraphs 13-18 of the specification state that metal foil based substrates are used in backplanes to provide excellent handling properties due to the material's strength, flatness and conductivity (see the last sentence of Paragraph 17). Such properties would not be provided unless the metal foil is continuous and mechanically coherent.

(b) Disclosure of Blackwell

Blackwell (see the Abstract) relates to a method for vapor phase depositing a thin seed layer of, for example, chromium and copper onto the side walls of

through holes in thin film substrates of, for example, polyimide. This method is stated to be useful in fabricating devices such as a thin film semiconductor chip carrier in which a semiconductor chip mounted on one major surface of the chip carrier is electrically connected to a ground plane and/or a power conductor on the other major surface of the chip carrier via one or more metallized through holes.

The Blackwell process is well illustrated in his Figures 1(a) to 1(g). As illustrated in those Figures, and as described at column 6, line 62 to column 10, line 49 of the specification, the process begins with a bare polymeric substrate (10), which may be formed of polyimide (see column 6, lines 62-65). A thin seed layer (30) is deposited on one surface (15) of substrate (10) (see column 7, lines 20-22), followed by metallic layers of chromium (20) and copper (25) (see column 7, lines 23-29 and Figure 1(b)). Apertures (50) are formed through substrate (10) (see column 7, lines 51-55 and Figure 1(c)).

The next step of the Blackwell process is an elaborate sputtering process, the details of which are irrelevant for present purposes, but which deposits a seed layer (250), a chromium layer (230) and a copper layer (240) on to the lower surface (35) of substrate (10) (as illustrated in Figure 1(d)) with the same layers extending through the apertures (50) so that the various layers are continuous between the two opposed surfaces of the substrate (10) (see column 9, line 66 to column 10, line 3). The top seed layer (30) (and, apparently the overlying chromium and copper layers (20 and 25)) are then photolithographically patterned to form lands (260) encircling the apertures (50) and circuit lines (270) intersecting the lands (260), as depicted in Figure 1(e). Alternatively, the lands (260) are dispensed with and circuit lines (270) are formed which directly intersect the apertures (50), as depicted in Figure 1(f) (see column 10, lines 15-21). In addition, the bottom seed layer (250) (and, apparently the overlying chromium and copper layers (230 and 240)) is photolithographically patterned to form a ground plane and/or a power conductor (not depicted). Finally, one or more integrated circuit devices 280 are mounted on the resultant structure (see Figure 1(g) and column 10, lines 44-49).

(c) Disclosure of Iwanaga

Iwanaga is primarily concerned with a liquid crystal display device comprising a pair of substrates having an electrode on a surface thereof, and a liquid crystal layer containing a liquid crystal and a dichroic dye, wherein the dichroic dye is an anthraquinone dye of a specified formula. However, as part of this liquid crystal display, Iwanaga does disclose in Figures 5A and 5B, and column 41, lines 49-67, a backplane comprising a plurality of thin film transistors (32) provided on an insulating polymeric substrate (31).

(d) The present claims are not obvious over Blackwell and Iwanaga

(i) Claims 1-11

Blackwell does not describe any structure which has, *at the same time*, a patterned metal foil having a plurality of apertures therein, a coating of an insulating polymeric material on at least one side of the metal foil and thin film electronic devices on the polymeric material, as required by the present claims 1-11. In Blackwell, the thin film electronic device or devices ("chip" 280) are only applied in the last stage of the process, between Figures 1(f) and 1(g). By this stage of the Blackwell process, there is no patterned metal foil present.

For purposes of argument, the applicants concede that, at the stage of the Blackwell process represented by his Figure 1(d), it may be arguable that a patterned metal foil having apertures therein is present. However, the later photolithographic patterning of the top seed layer (30) (between Figures 1(d) and 1(e)) destroys this single metal foil, leaving only a series of isolated conductive leads 270 as shown in Figure 1(e) or 1(f). This destruction of the single metal foil occurs prior to the placing of the chip 280 on to these leads 270, as shown in Figure 1(g). Obviously, in the structure shown in Figure 1(e) or 1(f), it would make no sense to have the metal layer on the upper surface of the polyimide layer (10) continuous except for the apertures 50 since this would

simply short out all the contacts on the chip (280), thus rendering the chip useless. Thus, at no time in the Blackwell process is there present simultaneously a patterned metal foil having a plurality of apertures therein, and a thin film electronic device on a polymeric layer overlying the patterned metal foil. While at an early stage (Figure 1(d)) in the production of the Blackwell structure, a continuous metal layer may be present, at this early stage no electronic devices are present in the structure, since such electronic devices are present only after bonding of the chip 280 on to the leads 270, after the metal layer has been patterned to form the leads 270. Thus, as already noted, Blackwell does not describe any structure which has, at the same time, a patterned metal foil, a coating of an insulating polymeric material and thin film electronic devices on the polymeric material.

In the final Office Action, pages 13-14, the Examiner attempts to rebut arguments similar to those presented above by arguing that it is the lower metal layer (240) which constitutes the patterned metal foil required by present claims 1-11. Although there is no illustration of the exact form of the metal layer on the lower surface of the polyimide, Blackwell states explicitly (see column 10, lines 22-24) that the bottom layer is also photographically patterned to form a ground plane and/or a power conductor. Furthermore, since upper and lower metal layers are electrically connected by the metallization extending through the apertures (50), leaving the lower metal layer as a continuous metal foil would have exactly the same effect as leaving the upper metal continuous, i.e., this would simply short out all the contacts on the chip (280), thus rendering the chip useless. Thus, the lower metal layer (240) in Blackwell cannot be a continuous metal foil, as suggested in the final Office Action.

Furthermore, the Blackwell structure fails to meet the requirement of the last clause of claim 1 that "the insulating polymeric material separates the thin film electronic devices from the patterned metal foil". In Blackwell, the upper and lower films are electrically connected via the metal layers extending through the apertures. This is not

merely a matter of design choice but is related to the very different functions of the Blackwell device and that of the present invention; the Blackwell device is a chip carrier intended to provide electrical connections to a chip whereas the device of present claims 1 uses the metal foil as a mechanical support for the thin film electronic devices.

With regard to claim 1, it is unclear to the undersigned attorney what Iwanaga is alleged to add to the disclosure in Blackwell, and in particular why the skilled worker would consider it obvious to combine Iwanaga (which relates to a liquid crystal display) with Blackwell (which relates to a chip carrier). The final Office Action states (see pages 3-4):

> As Iwanaga et al. disclosed one of ordinary skill in the art would have been motivated to provide a plurality of thin film electronic devices on the insulating polymeric material in order to provide a liquid crystal display device capable of realizing a bright and clear color display (see col. 2, lines 42-44 of Iwanaga et al.).
>
> Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to modify Blackwell et al. reference with a plurality of thin film electronic devices provided on the insulating polymeric material as taught by Iwanaga et al. in order to obtain a liquid crystal display device capable of realizing a bright and clear color display (see col. 2, lines 42-44 of Iwanaga et al.).

With respect, this passage avoids the crucial issue. The passage at column 2, lines 42-44 of Iwanaga, to which reference is made, is a general statement of the advantages of the Iwanaga invention, and, as shown by the paragraph beginning at column 2, line 45 which immediately follows it, refers to the use of the specified anthraquinone dyes in the Iwanaga liquid crystal medium, and not to any electrical structure in the display, which uses a conventional active matrix backplane (although the three layer liquid crystal structure is of course not conventional). There is nothing in Iwanaga to suggest that

adopting the Blackwell structure will do anything to improve the performance of the Iwanaga device. In the absence of any such suggestion, there is no reason why a skilled worker would combine the active matrix backplane of Iwanaga with the chip carrier of Blackwell.

The foregoing arguments are applicable to all of claims 1-11. However, there are additional reasons why claims 3 and 4 are patentable over the combination of Blackwell and Iwanaga. These claims relate to backplanes according to claim 1 in which the apertures occupy at least 30 per cent of the area of the patterned metal foil. Blackwell teaches (see column 7, lines 51-62) that the size of his apertures should be limited to the range of 75-1500 μm. Given the number and limited size of apertures taught by Blackwell, there is no way in which the apertures could occupy anything remotely approaching 30 per cent of the area of the patterned metal foil.

(ii) Claims 12, 14 and 15

These claims also require the presence of a metal foil and for the reasons stated under (i) above, the combination of Blackwell and Iwanaga does not suggest such a metal foil.

(iii) Claims 24-26

These claims relate to an electro-optic display having a central portion comprising an electro-optic material and a peripheral portion, the peripheral portion having a plurality of apertures by means of which the electro-optic display may be stitched to a flexible medium. In Blackwell the apertures lie entirely within the central portion of the substrate occupied by the chip (280). If one wished to combine Blackwell and Iwanaga, the only logical way to do so would be to place the apertures (50) of Blackwell adjacent to the electrodes (32) of Iwanaga, and thus within the central area of the Iwanaga display occupied by the liquid crystal medium. Hence, combining Blackwell and Iwanaga would not lead a skilled worker to place an electro-optic medium in the

center of a display and surround it with apertures provided in a peripheral area of the display, as required by present claims 24-26.

For all the foregoing reasons, the 35 USC 103 rejection of the present claims is unjustified and should be withdrawn, and the application allowed.

Respectfully submitted
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CLAIMS APPENDIX

Claims on Appeal

1. A backplane for use in an electro-optic display, the backplane comprising a patterned metal foil having a plurality of apertures extending therethrough, coated on at least one side with an insulating polymeric material and having a plurality of thin film electronic devices provided on the insulating polymeric material, whereby the insulating polymeric material separates the thin film electronic devices from the patterned metal foil.

2. A backplane according to claim 1 wherein the apertures are arranged on a rectangular grid.

3. A backplane according to claim 1 wherein the apertures occupy at least about 30 percent of the area of the patterned metal foil.

4. A backplane according to claim 3 wherein the apertures occupy at least about 60 percent of the area of the patterned metal foil.

5. A backplane according to claim 1 wherein the patterned metal foil is coated on both sides with an insulating polymeric material.

6. A backplane according to claim 5 wherein the patterned metal foil is coated on both sides with the same insulating polymeric material.

7. A backplane according to claim 5 wherein the patterned metal foil is coated on its two sides with different insulating polymeric materials.

8. A backplane according to claim 1 wherein each of the thin film electronic devices lies entirely within the area of one aperture in the metal foil.

9. A backplane according to claim 1 wherein each of the thin film electronic devices extends across a plurality of apertures in the metal foil.

10. An electro-optic display comprising a backplane according to claim 1.

11. An electro-optic display according to claim 10 comprising an encapsulated electrophoretic electro-optic medium.

12. A backplane for use in an electro-optic display, the backplane comprising a metal foil coated on at least one side with an insulating polymeric material and having a plurality of thin film electronic devices provided on the insulating polymeric material, the backplane further comprising at least one conductive via extending through the polymeric material and electrically connecting at least one of the thin film electronic devices to the metal foil, wherein the metal foil serves as at least one of an antenna, an inductor loop, a power plane, a capacitor, a capacitor contact, a pixel electrode, and electromagnetic induction shielding.

13. (Cancelled).

14. An electro-optic display comprising a backplane according to claim 12.

15. An electro-optic display comprising a backplane, the backplane comprising a metal foil coated on at least one side with an insulating polymeric material and having a plurality of thin film electronic devices provided on the insulating polymeric material, the backplane further comprising at least one conductive via extending through the polymeric material and electrically connecting at least one of the thin film electronic devices to the metal foil, the electro-optic display having the form a smart card, the metal foil serving to communication between the card and a card reading apparatus.

Claims 16-23. (Cancelled).

24. An electro-optic display having a metal substrate, the display having a central portion comprising an electro-optic material and means for writing an image on the electro-optic material, and a peripheral portion extending around at least part of the periphery of the central portion, the peripheral portion having a plurality of

apertures extending through the metal substrate, by means of which apertures the electro-optic display may be stitched to a flexible medium.

25. An electro-optic display according to claim 24 wherein the peripheral portion of such a display is free from the electro-optic material.

26. An electro-optic display according to claim 24 wherein the peripheral portion extends completely around the central portion so that the entire periphery of the electro-optic display can be stitched to the flexible medium.

Claims 27-31. (Cancelled).

EVIDENCE APPENDIX

[None]

RELATED PROCEEDINGS APPENDIX

[None]